



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

☒ Preliminary Specification☐ Final Specification

Module	19" Color TFT-LCD (Free Shape LCD)
Model Name	G190SF01 V0

<table><tr><td>Customer</td><td>Date</td></tr><tr><td> </td><td> </td></tr><tr><td>Checked & Approved by</td><td></td></tr><tr><td> </td><td> </td></tr></table>	Customer	Date			Checked & Approved by				<table><tr><td>Approved by</td><td>Date</td></tr><tr><td> Debbie Chiu</td><td> 2011/02/24</td></tr><tr><td>Prepared by</td><td></td></tr><tr><td> Jimmy Tsai</td><td> 2011/02/24</td></tr></table>	Approved by	Date	Debbie Chiu	2011/02/24	Prepared by		Jimmy Tsai	2011/02/24
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Note: This Specification is subject to change without notice.	General Display Business Division / AU Optonics corporation																



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

Contents

1. Operating Precautions	4
2. General Description	5
2.1 Display Characteristics	5
2.2 Optical Characteristics	6
3. Functional Block Diagram	9
4. Absolute Maximum Ratings	10
4.1 Absolute Ratings of TFT LCD Module	10
4.2 Absolute Ratings of Environment	10
5. Electrical Characteristics	11
5.1 TFT LCD Module	11
5.2 Backlight Unit	13
6. Signal Characteristic	14
6.1 Pixel Format Image	14
6.2 Signal Description	15
6.3 The Input Data Format	16
6.4 Interface Timing	17
6.5 Power ON/OFF Sequence	18
7. Connector & Pin Assignment	19
7.1 TFT LCD Module: LVDS Connector	19
7.2 Backlight Unit: LED Connector	20
8. Reliability Test	21
9. Mechanical Characteristics	22
10. Label and Packaging	24
10.1 Shipping Label (on the rear side of TFT-LCD display)	24
10.2 Carton Package (TBD)	24
11. Safety	25
11.1 Sharp Edge Requirements	25
11.2 Materials	25
11.3 Capacitors	25
11.4 National Test Lab Requirement	25



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

Record of Revision

Version and Date	Page	Old description	New Description	Remark
0.1 2011/01/27	All	First Edition for Customer	All	
0.2 2011/02/24	5	Thickness 18.5 mm (max)	Thickness 18.0 mm (max)	



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

1. Operating Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open or modify the Module Assembly.
- 8) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, take it easily, or the TFT Module may be damaged.
- 9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 10) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
- 11) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
- 12) Severe temperature condition may result in different luminance, response time and LED life time.
- 13) The data on this specification sheet is applicable when LCD module is placed in landscape position.
- 14) Continuous displaying fixed pattern may induce image sticking. It is recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

2. General Description

This specification applies to the 19 inch-wide Color TFT-LCD Module G190SF01 V0.

The display supports the 1680(H) x 342(V) screen format and 16.7M colors. All input signals are 2 Channels LVDS interface compatible.

LED driver board is included. G190SF01 V0 is designed for industrial display applications.

2.1 Display Characteristics

The following items are characteristics summary on the table under 25 °C condition:

Items	Unit	Specifications
Screen Diagonal	[inch]	19
Active Area	[mm]	473.76 (H) x 96.44(V)
Pixels H x V		1680x3(RGB) x 342
Pixel Pitch	[mm]	0.282x 0.2
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		P-MVA Mode, Normally Black
Nominal Input Voltage VDD	[Volt]	+5.0 V
Typical Power Consumption	[Watt]	25 W (Typ) (All white pattern)
Weight	[Grams]	1500 (Typ)
Physical Size	[mm]	493.7(W) x 124.8(H) x 18.0(D) (Typ)
Electrical Interface		Dual Channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		16.7M colors (6-bits + HiFRC)
Temperature Range Operating Storage (Non-Operating)	[°C] [°C]	0 to +50 -20 to +60
RoHS Compliance		RoHS Compliance



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25℃ (Room Temperature):

Item	Unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	[cd/m ²]	I _F = 80mA	240	300	-	1
Uniformity	%	9 Points	75	80	-	1, 2, 3
Contrast Ratio			1600	2000	-	4
Cross talk	%		-	-	1.5	5
Response Time	[msec]	Rising	-	15	-	6
		Falling	-	5	-	
		Rising + Falling	-	20	-	
		Gray to Gray	-	8	-	
Viewing Angle	[degree]	Horizontal (Right) CR = 10 (Left)	75	89	-	7
	[degree]		75	89	-	
	[degree]	Vertical (Upper) CR = 10 (Lower)	75	89	-	
	[degree]		75	89	-	
Color / Chromaticity Coordinates (CIE 1931)		Red x		TBD		
		Red y		TBD		
		Green x		TBD		
		Green y		TBD		
		Blue x		TBD		
		Blue y		TBD		
		White x	0.283	0.313	0.343	
		White y	0.299	0.329	0.359	
Color Gamut	%			68	-	

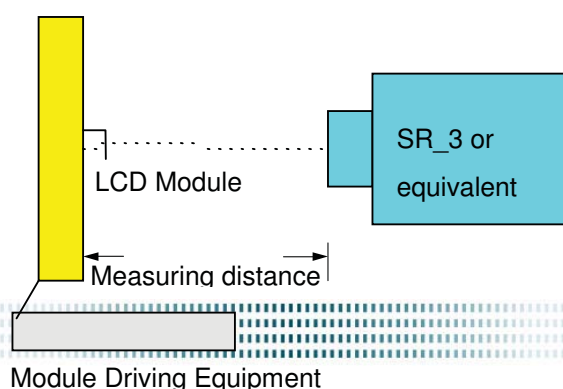
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

Aperture 1° with 50cm viewing distance

Test Point Center

Environment < 1 lux



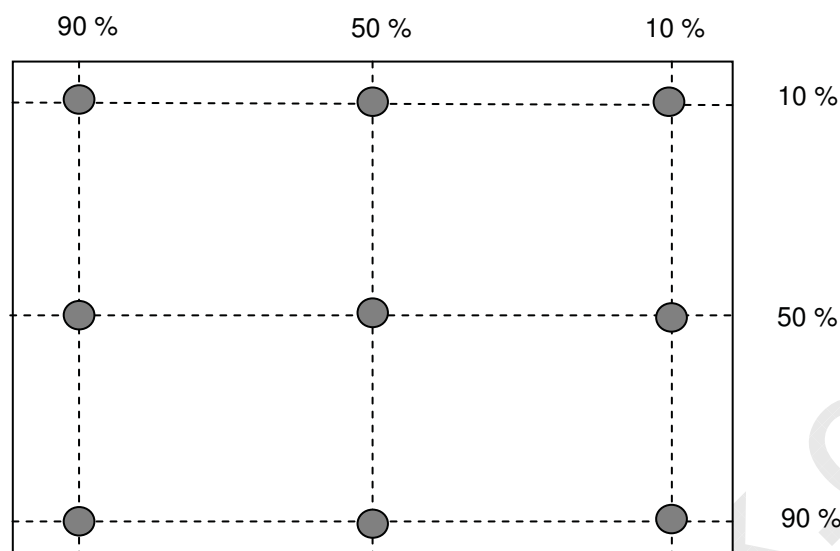


Product Specification

AU OPTRONICS CORPORATION

G190SF01 V0

Note 2: Definition of 9 points position (Display active area : 473.76(H) x 296.10(V))



Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance

$$\delta_{w9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

Note 4 : Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

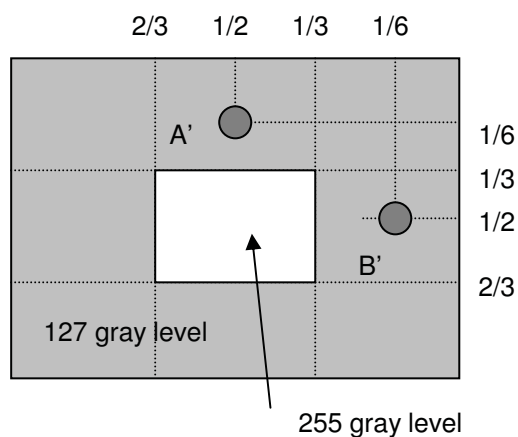
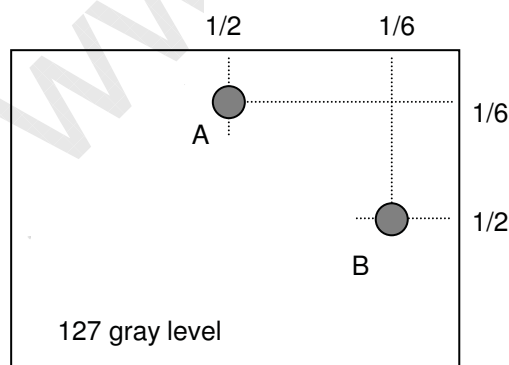
Note 5 : Definition of cross talk (CT)

$$CT = |YB - YA| / YA \times 100 (\%)$$

Where

YA = Luminance of measured location without gray level 255 pattern (cd/m²)

YB = Luminance of measured location with gray level 255 pattern (cd/m²)





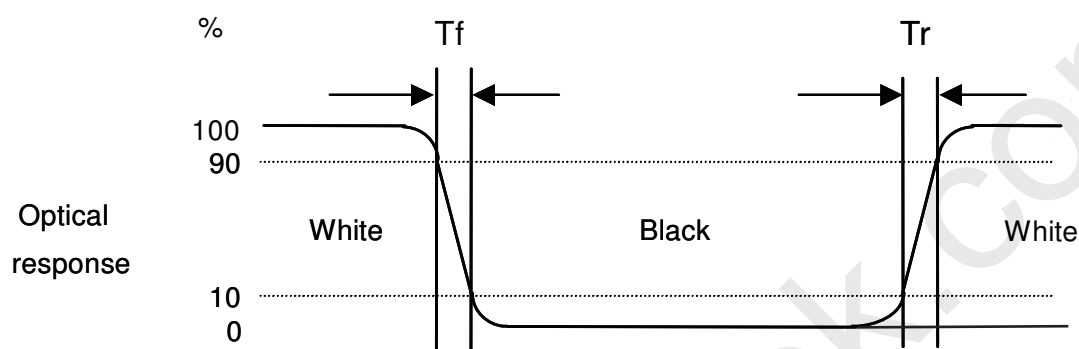
Product Specification

AU OPTRONICS CORPORATION

G190SF01 V0

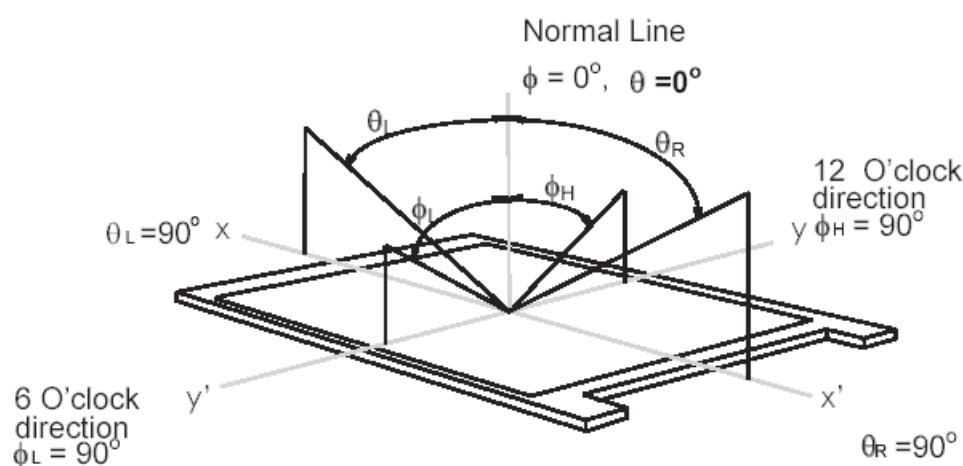
Note 6: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



Note 7: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.





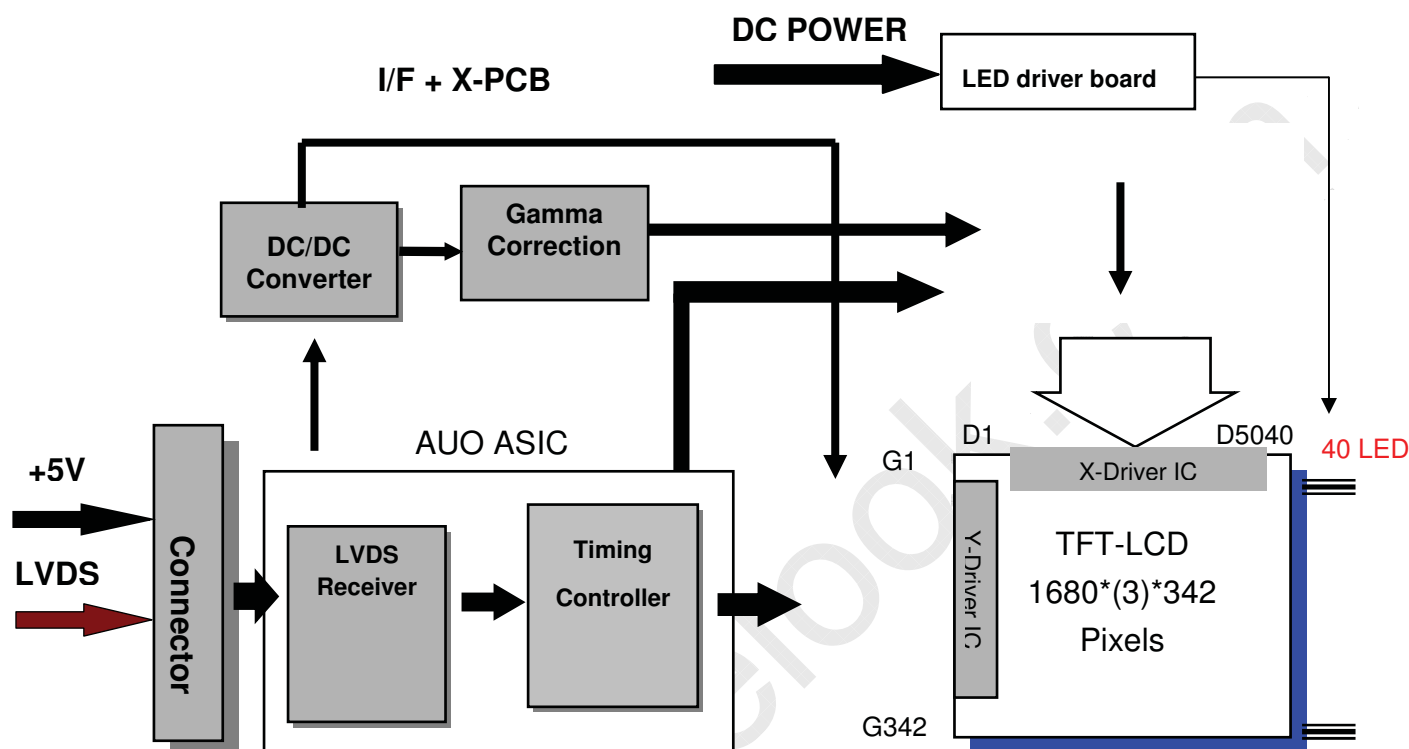
Product Specification

AU OPTRONICS CORPORATION

G190SF01 V0

3. Functional Block Diagram

The following diagram shows the functional block of the 19 inches wide Color TFT-LCD Module:



LVDS Connector: JAE (FI-XB30SRL-HF11) or equivalent.

LED Connector: SIN SHENG (MS24049HJ) or equivalent.



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

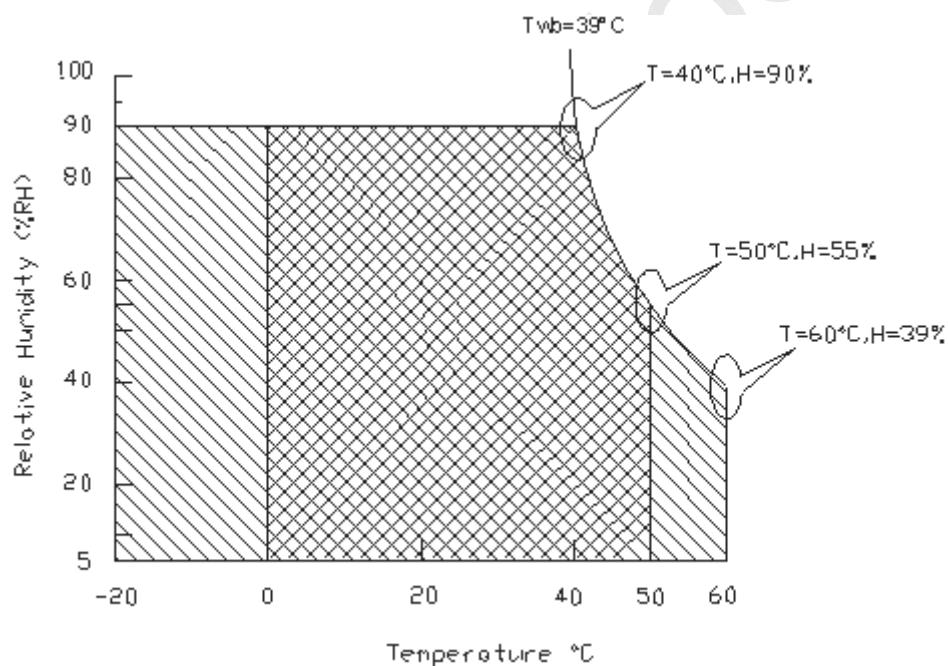
4. Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module

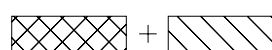
Item	Symbol	Min	Max	Unit
Logic/LCD Drive Voltage	VDD	-0.3	+5.5	[Volt]

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	0	+50	[°C]
Operation Humidity	HOP	5	90	[%RH]
Storage Temperature	TST	-20	+60	[°C]
Storage Humidity	HST	8	90	[%RH]



Storage Range





Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

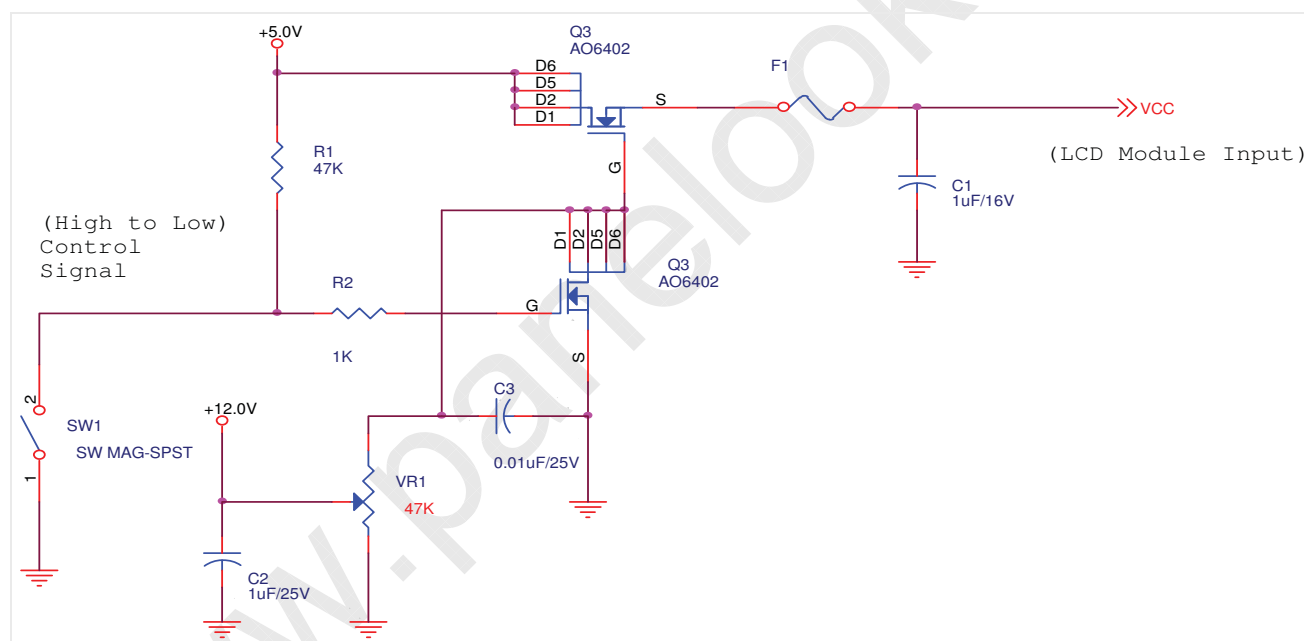
5. Electrical Characteristics

5.1 TFT LCD Module

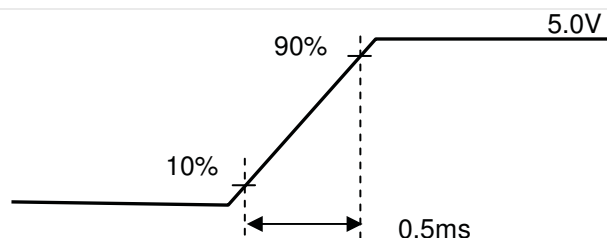
5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	± 10%
IDD	VDD Current	-	1200	TBD	[mA]	VDD= 5.0V, All White Pattern At 60Hz
Irush	LCD Inrush Current	-	-	3.5	[A]	Note 1
PDD	VDD Power	-	6	TBD	[Watt]	VDD= 5.0V, All White Pattern At 60Hz

Note 1: Measurement condition:



VDD rising time 0V





Product Specification

AU OPTRONICS CORPORATION

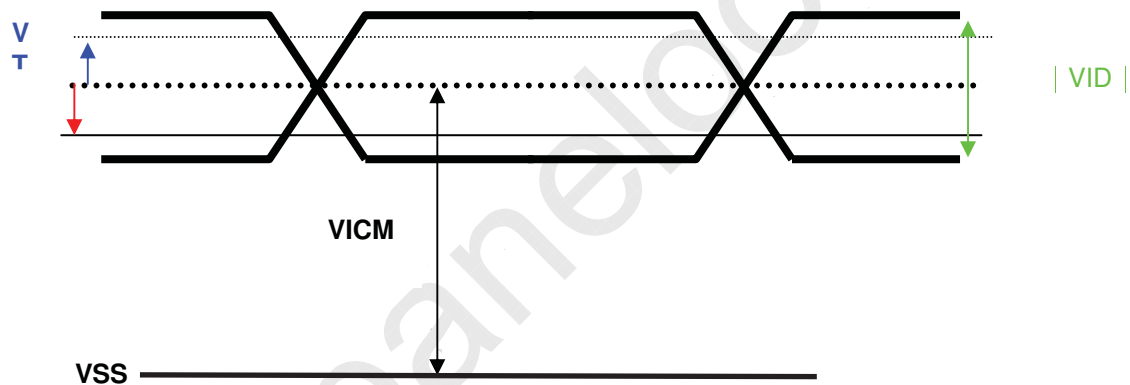
G190SF01 V0

5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	-	-	100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VCM=1.2V
VID	Input Differential Voltage	100	400	600	[mV]	
VICM	Differential Input Common Mode Voltage	0.3	-	1.25	[V]	VTH/VTL=±100mV

Note: LVDS Signal Waveform.





Product Specification

AU OPTRONICS CORPORATION

G190SF01 V0

5.2 Backlight Unit

5.2.1 LED Light Bar

Following characteristics are measured under stable condition at 25°C (Room Temperature).

Symbol	Parameter	Min	Typ	Max	Unit	Remark
I_F	LED Forward Current	-	80		mA	$T_a = 25^\circ\text{C}$
V_F	LED Forward Voltage	-	3.3	-	Volt	$I_F = 80\text{mA}$, $T_a = 0^\circ\text{C}$
		-	3.2	3.6	Volt	$I_F = 80\text{mA}$, $T_a = 25^\circ\text{C}$
		-	3.1	-	Volt	$I_F = 80\text{mA}$, $T_a = 50^\circ\text{C}$
P_{LED}	LED Power	-	10.24	11.52	Watt	One string, $I_F = 80\text{mA}$, $T_a = 25^\circ\text{C}$
Operating Life		50,000			Hrs	$I_F = 80\text{mA}$, $T_a = 25^\circ\text{C}$

Note 1: T_a means ambient temperature of TFT-LCD module.

Note 2: If module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 3: Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Note 4: LED light bar structure:





Product Specification

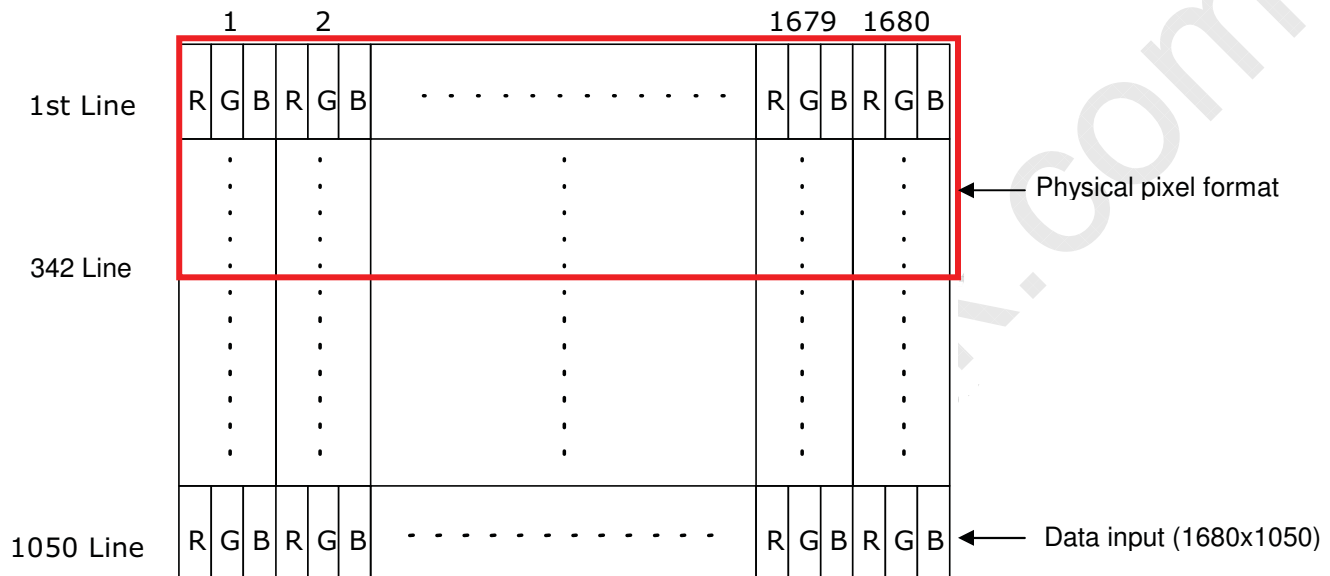
G190SF01 V0

AU OPTRONICS CORPORATION

6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.. Although this panel resolution is 1680x342, please input 1680x1050 format signal to it. And the data after line 343 (inlculde 343) ALL should be set to "black" command.





Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

6.2 Signal Description

The module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83(negative edge sampling) or compatible. The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

PIN #	SIGNAL NAME	DESCRIPTION
1	RXinO0-	Negative LVDS differential data input (Odd data)
2	RXinO0+	Positive LVDS differential data input (Odd data)
3	RXinO1-	Negative LVDS differential data input (Odd data)
4	RXinO1+	Positive LVDS differential data input (Odd data)
5	RXinO2-	Negative LVDS differential data input (Odd data, H-Sync, V-Sync, DSPTMG)
6	RXinO2+	Positive LVDS differential data input (Odd data, H-Sync, V-Sync, DSPTMG)
7	GND	Power Ground
8	RxOCLKIN-	Negative LVDS differential clock input (Odd clock)
9	RxOCLKIN+	Positive LVDS differential clock input (Odd clock)
10	RXinO3-	Negative LVDS differential data input (Odd data)
11	RXinO3+	Positive LVDS differential data input (Odd data)
12	RXinE0-	Negative LVDS differential data input (Even data)
13	RXinE0+	Positive LVDS differential data input (Even data)
14	GND	Power Ground
15	RXinE1-	Negative LVDS differential data input (Even data)
16	RXinE1+	Positive LVDS differential data input (Even data)
17	GND	Power Ground
18	RXinE2-	Negative LVDS differential data input (Even data)
19	RXinE2+	Positive LVDS differential data input (Even data)
20	RxECLKIN-	Negative LVDS differential clock input (Even clock)
21	RxECLKIN+	Positive LVDS differential clock input (Even clock)
22	RXinE3-	Negative LVDS differential data input (Even data)
23	RXinE3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	NC	No contact (For AUO test only)
26	NC	No contact (For AUO test only)
27	NC	No contact (For AUO test only)
28	VCC	+5.0V Power Supply
29	VCC	+5.0V Power Supply
30	VCC	+5.0V Power Supply

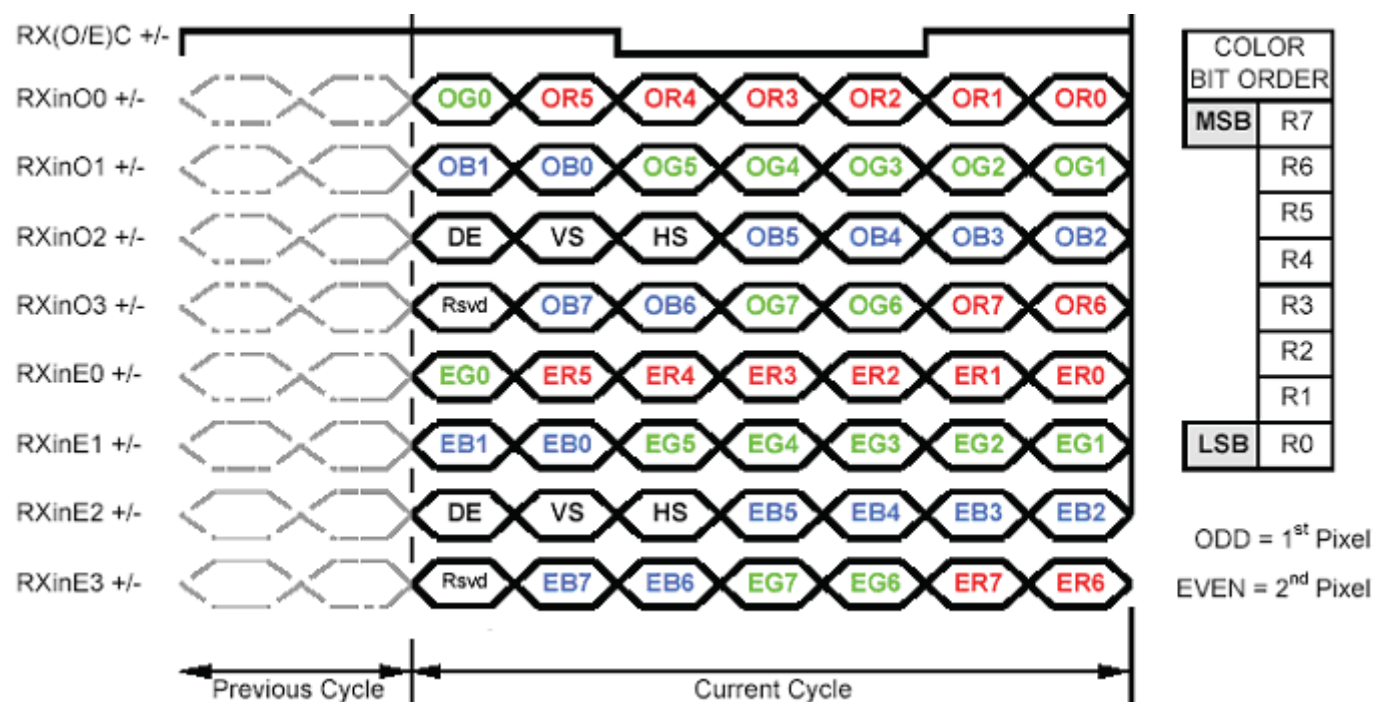


Product Specification

AU OPTRONICS CORPORATION

G190SF01 V0

6.3 The Input Data Format



Note1: 8-bits signal input.

Note2: L:NS alike H:Thine alike



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

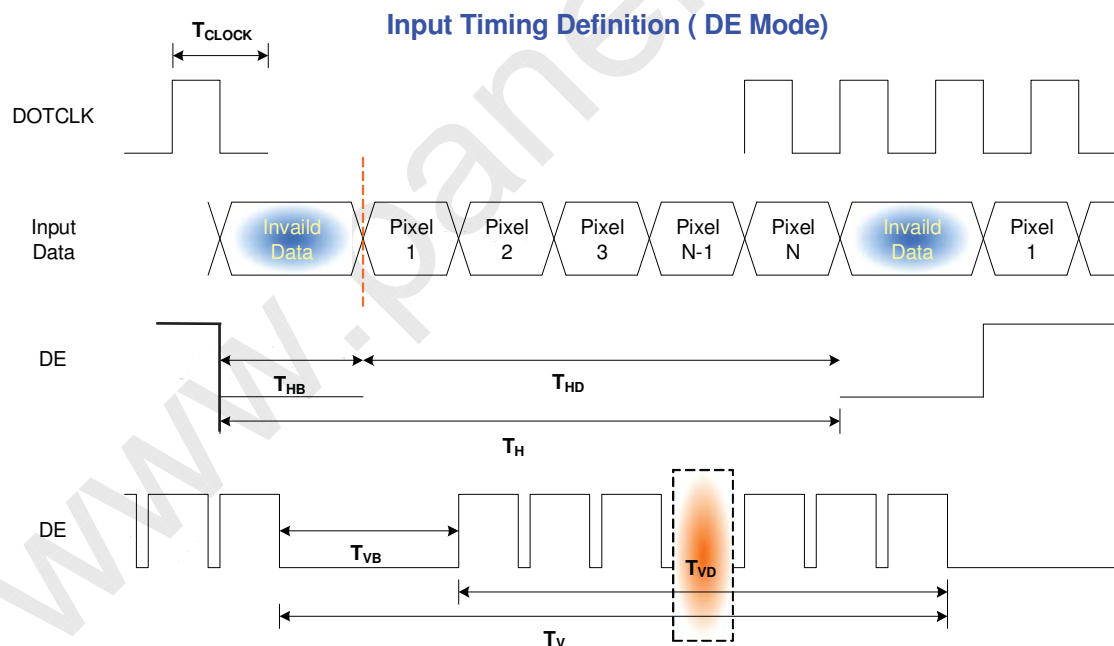
6.4 Interface Timing

6.4.1 Timing Characteristics

Signal	Item	Symbol	Min	Typ	Max	Unit
Clock	Frequency	$1/T_{\text{Clock}}$	60	72.1	85	MHz
Frame Rate	Frequency	$1/T_v$	50	60	75	Hz
Vertical Section	Period	T_v	1058	1066	2048	T_{line}
	Active	T_{VD}	1050	1050	1050	
	Blanking	T_{VB}	8	16	998	
Horizontal Section	Period	T_H	880	1128	2048	T_{clock}
	Active	T_{HD}	840	840	840	
	Blanking	T_{HB}	40	288	1208	

Note: DE mode only.

6.4.2 Input Timing Diagram



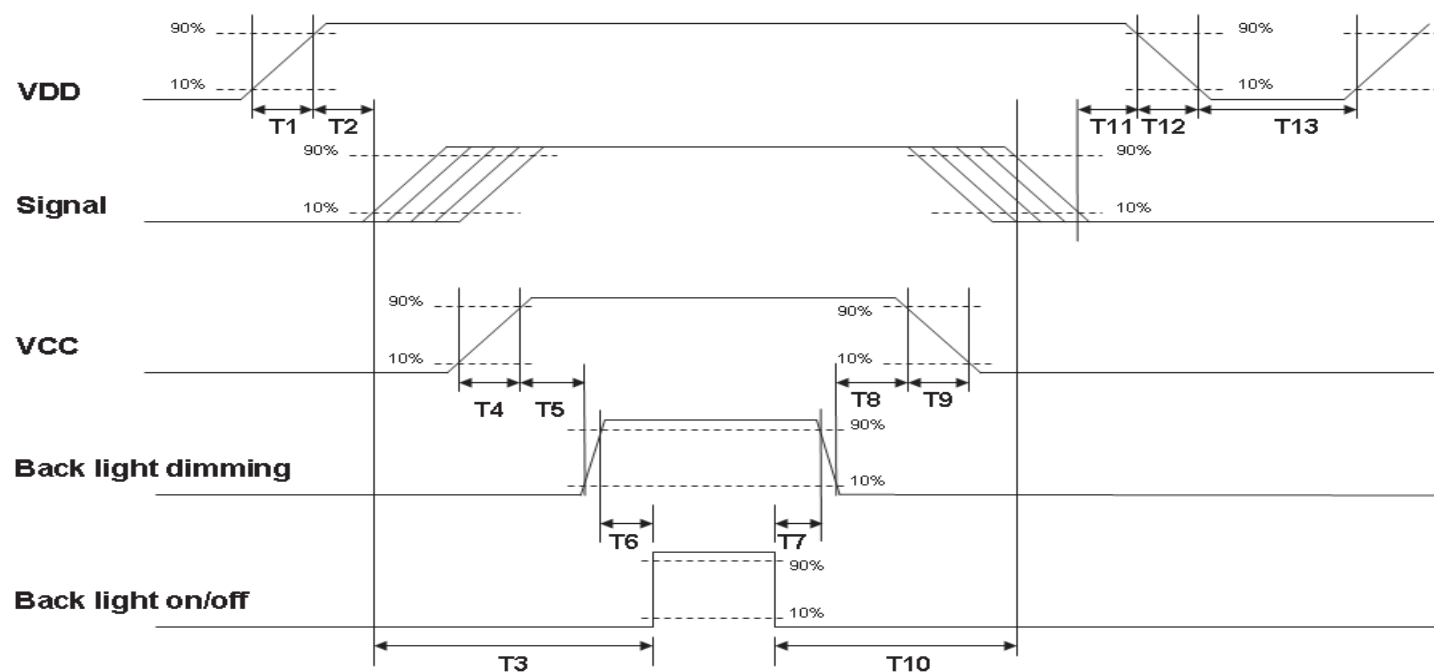


Product Specification

AU OPTRONICS CORPORATION

G190SF01 V0

6.5 Power ON/OFF Sequence



Parameter				Units
	Min.	Typ.	Max.	
T1	0.5	--	10	[ms]
T2	30	40	50	[ms]
T3	200	--	--	[ms]
T4	0.5	--	10	[ms]
T5	10	--	--	[ms]
T6	10	--	--	[ms]
T7	0	--	--	[ms]
T8	10	--	--	[ms]
T9	--	--	10	[ms]
T10	110	--	--	[ms]
T11	0	16	50	[ms]
T12	--	--	10	[ms]
T13	1000	--	--	[ms]

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

7. Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module: LVDS Connector

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	LVDS: JAE or compatible
Type Part Number	LVDS : JAE (FI-XB30SRL-HF11) or equivalent.
Mating Housing Part Number	FI-X30H (JAE) or compatible

Pin#	Signal Name	Pin#	Signal Name
1	RxOIN0-	2	RxOIN0+
3	RxOIN1-	4	RxOIN1+
5	RxOIN2-	6	RxOIN2+
7	GND	8	RxOCLKIN-
9	RxOCLKIN+	10	RxOIN3-
11	RxOIN3+	12	RxEIN0-
13	RxEIN0+	14	GND
15	RxEIN1-	16	RxEIN1+
17	GND	18	RxEIN2-
19	RxEIN2+	20	RxECLKIN-
21	RxECLKIN+	22	RxEIN3-
23	RxEIN3+	24	GND
25	NC	26	NC
27	NC	28	VCC
29	VCC	30	VCC



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

7.2 Backlight Unit: LED Connector

Connector Name / Designation	LED Connector
Manufacturer	SIN SHENG or compatible
Connector Model Number	MS24049HJ
Mating Model Number	2404PS-2or compatible

PIN #	SIGNAL NAME	DESCRIPTION
1	V12	Input voltage, 12V
2	V12	Input voltage, 12V
3	V12	Input voltage, 12V
4	-	NC
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	BL_EN	Back light enable, 5V
9	BL_DIM_P	Back light dimming, 3.3V



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

8. Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias	Ta= 50℃ , 80%RH, 300hours	
High Temperature Operation	Ta= 50℃ , 300hours	
Low Temperature Operation	Ta= 0℃ , 300hours	
High Temperature Storage	Ta= 60℃ , 300hours	
Low Temperature Storage	Ta= -20℃ , 300hours	
Thermal Shock Test	-20℃/30min, 60℃/30min, 100 cycles	
Shock Test (Non-Operating)	50G,20ms,Half-sine wave,(±X, ±Y, ±Z)	
Vibration Test (Non-Operating)	1.5G, (10~200Hz, P-P) 30 mins/axis (X, Y, Z)	
On/off test	On/10 sec, Off/10 sec, 30,000 cycles	
ESD	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point.	Note 1
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 8 points, 25 times/ point.	

Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost

. Self-recoverable. No hardware failures.

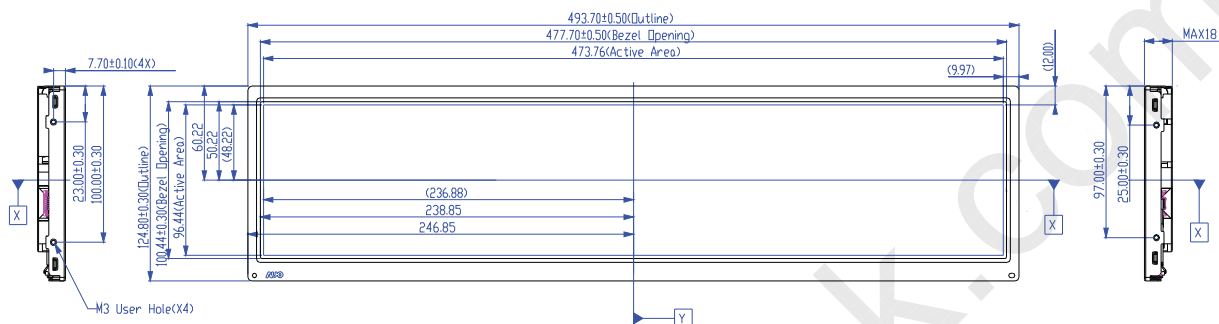


Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

9. Mechanical Characteristics

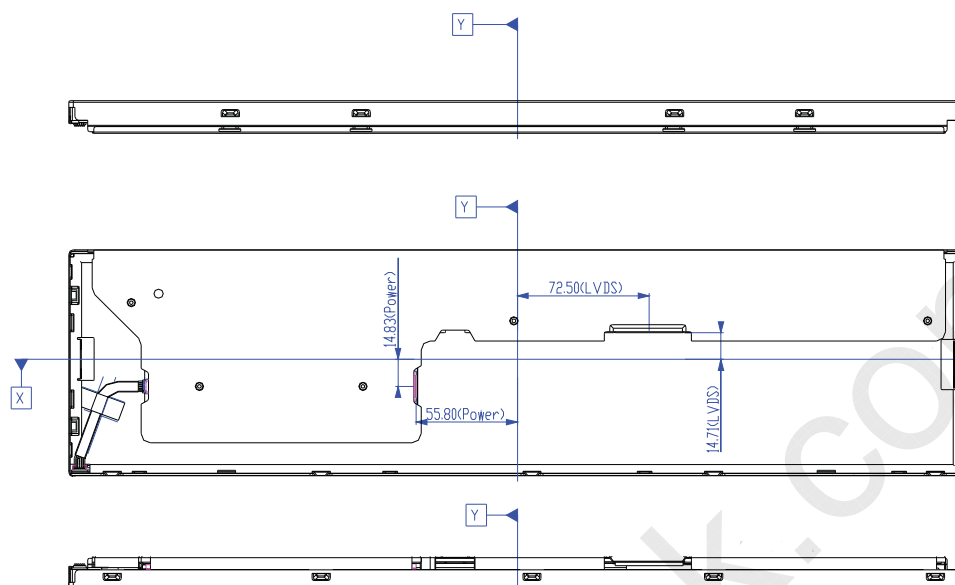




Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

**Note:**

1. User hole maximum insertion depth is 4mm.
2. Torque for M3 user hole should be below 3kgf-cm and re-screw 5 times.
3. Total weight of a module is TBD



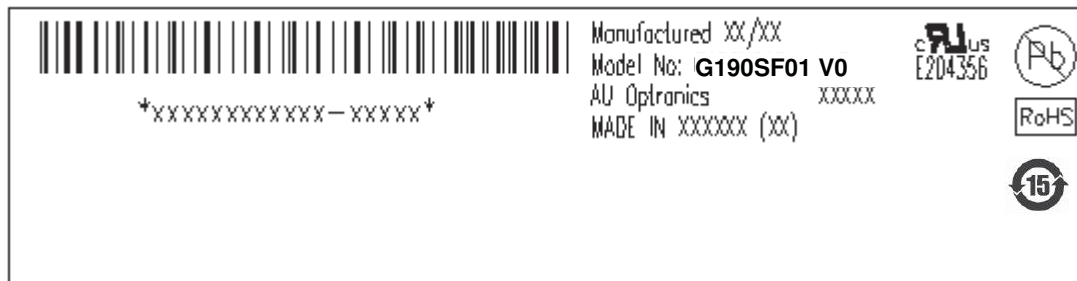
Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

10. Label and Packaging

10.1 Shipping Label (on the rear side of TFT-LCD display)



10.2 Carton Package (TBD)



Product Specification

G190SF01 V0

AU OPTRONICS CORPORATION

11. Safety

11.1 Sharp Edge Requirements

There will be no sharp edges or comers on the display assembly that could cause injury.

11.2 Materials

11.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

11.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

11.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

11.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance to:

UL 1950, First Edition

U.S.A. Information Technology Equipment